BANK STREET, PYRMONT MASTER PLAN
ESD CONCEPTS
ENERGY, MATERIALS AND CONSTRUCTION METHODS

1. Introduction

The building envelopes referred to within the Bank Street, Pyrmont Master Plan should be designed to achieve new standards in energy efficiency incorporating high levels of ESD strategies. This will be accomplished through a combination of passive design principles and innovative technology.

Low energy architecture involves building a structure to provide comfortable internal conditions to take advantage of the local climate. The passive design strategy should promote the use of daylighting to the occupied spaces. The building form should guide and attenuate the prevailing summer and winter winds providing a cooling function or shelter.

Active design measures should also form a significant part of the low energy initiatives. The use of high efficiency cooling plant, variable speed pumping and centralised site wide building management systems will minimise peak power demand and greenhouse gas emissions.

The commercial office buildings have the potential to consume the majority of the power for the site and therefore are critical in the scheme to ensure a low energy solution. The buildings should demonstrate the latest technology with sound environmental credentials. To that end, the commercial buildings should aim to achieve 4.5 stars in accordance with the ABGR scheme. This will be achieved through the application of passive design initiatives such as mixed mode air conditioning where applicable and promote the abundance of natural light to the offices from the atrium spaces. The application of these passive and active low energy design initiatives should ensure the commercial buildings will be capable of providing high levels of comfort with minimal energy consumption.

Occupant comfort is one of the main factors affecting the success of any building. The promotion of maximum daylighting and naturally ventilated mixed mode areas will provide occupants with a high level of amenity.

The key ESD opportunities of the project will be to:

- Minimise peak electrical demand through the use of demand management technologies
- Minimise the emissions of greenhouse gases through energy efficient plant installations
- Reduce or eliminate pollutant substances such as Ozone depleting refrigerants
- Construct the precinct from materials which minimises the impact on the environment
- Maintain and operate the development to reduce or minimise harmful effects on people and the natural environment.

2. Building Design

2.1 General Description

The commercial office buildings have the potential to consume the majority of the power for the site and therefore are critical in the scheme to ensure a low energy solution.

The buildings should demonstrate the latest technology with sound environmental credentials.

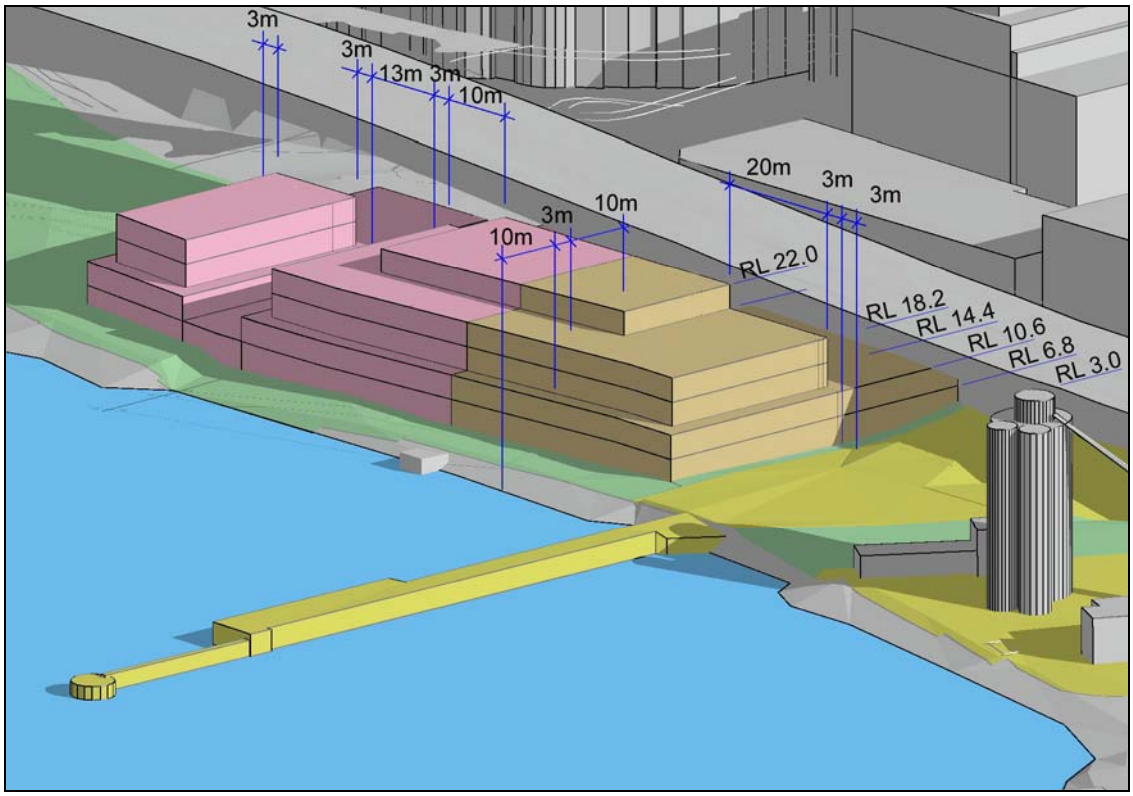
To that end, the commercial buildings should aim to achieve 4.5 stars in accordance with the Australian Building Greenhouse Rating (ABGR) scheme. This should be achieved through consideration of passive design initiatives such as mixed mode air conditioning and the provision of natural light to the offices from the perimeter façade and the atrium spaces. The application of these passive low energy design initiatives in addition to low energy active initiatives will ensure the commercial buildings will be capable of providing high levels of comfort with minimal energy consumption.

In order to improve the view corridor from Quarry Master Drive, it is proposed that an atrium be provided inline from Quarry Masters Drive to the edge of the harbour. The atrium would be a full height atrium passing through the facility which would achieve the objectives of maintaining the view corridor and providing a winter-garden space for occupants in the commercial zone. The atrium could form a naturally ventilated space with protection from winter westerly winds and the promotion of north-easterly breezes to create air movement inside during the summer months. The design of the atrium would be cognisant of the potential high solar loads of a glazed roof and as such would be designed to minimise summer and maximise winter solar gain.

By implementing the atrium into the Poulos site, the loss in floor area would be in the order of 1,990 m^2 over three floors. It is proposed that this would be regained from additional floor space partially on level 3 and all of Level 4. The level 4 area would be sited across the Poulos site and the Bidvest site creating 990 m^2. This additional floor would sit at an RL of 18.2 m. Any roof plant located above level 5 would be at RL 22.0.

	Pink	Brown	Yellow	Area Displaced by Atrium	Total area (m^2)
Ground	4363	2345		0	6708
L1	3610	2345		750	5955
L2	2572	1193		620	3765
L3	1742	1193		620	2935
L4	590	400		0	990
	12877	**7476**		**1990**	**20,353**
Plot area	5,143m^2	2,988m^2			
FSR	2.50	2.50			

The atrium occurs from the ground floor upwards providing amenity to occupants on the upper levels of the building and promoting the view corridor from Quarry Master Drive rising to the east. This is illustrated below.



Source: Scott Carver Pty Ltd

2.2 Mechanical Services

Some of the mechanical strategies which should be considered for the commercial buildings will include:

- Central high efficiency cooling and heating plant.
- Variable speed cooling and heating water circuits.
- High efficiency cooling towers operating at depressed wet bulb temperatures to dramatically increase the efficiency of chillers.
- Promotion of summer breezes between buildings to reduce façade load.
- Performance based carpark ventilation solution to improve air quality and reduce energy consumption.
- Centralised Building Management System (BMS) to provide coordinated operation of entire site.
- Dedicated outdoor air supply plant to each office building.
- CO_2 monitoring should be considered to control outdoor air rates to occupied spaces thereby ensuring a fresh environment with minimum energy consumption.
- High performance glazing should be considered to reduce solar heat gain in summer and increase visible light to occupied spaces.
- Structures should be constructed airtight to minimise infiltration.
- Shading should be provided to the western façade to minimise summer solar gain from mid-season to summer. The eastern and northern façades should be designed to promote winter passive morning warm-up. Operable western façade shading should also be considered
- Walls, roofs and floors should be provided with high standards of insulation.
- Efficient after-hours operation should be provided through the use of positive shut-off of air conditioning to separate zones during out-of-hours operation.
- Mixed mode air conditioning should be provided to break-out areas allowing occupants the benefit of natural ventilation to dedicated areas when the ambient conditions are favourable.

2.3 Electrical Services

Some of the electrical strategies which should be considered for the commercial buildings will include:

- Maximising daylighting into the atrium through the effective use of the atrium roof surfaces.
- Energy efficient T5 lighting throughout provide a significant reduction on the base building air conditioning load and allow tenants the ability achieve a 4.5 Star ABGR tenancy rating.
- Lighting zoning and switching which allows for areas to be isolated and or control to perimeter daylighting.
- Light-shelves on the northern aspects to promote daylighting to the perimeter zone spaces to reduce energy consumption through minimising lighting energy consumption.

- Lighting control systems to minimise the inappropriate use of lights when they are not required and provide out-of-hours lighting control.
- Occupancy sensors located in common areas to switch off lighting when not required.
- Provision of daylight wells to the underground carpark and painting ceiling and walls white to reduces light fittings and energy consumption.
- Occupancy sensors can be installed to operate underfloor carpark lighting from the security lighting level to occupied lighting level.
- Low energy metal halide external lighting operated with BMS and daylight sensors.

2.4 Hydraulics

Some of the hydraulic strategies which should be considered for the commercial buildings will include:

- Rainwater and stormwater recycling system.
- Minimising piping dead legs.
- Landscape watering using rainwater harvesting

2.5 Commissioning

A full 12 month commissioning plan should be developed to verify that systems are performing at their optimum efficiency for the occupied building and to optimise time schedules to best match occupant needs and system performance. The 12 month commissioning plan should include:

- Comprehensive pre-commissioning, commissioning and quality monitoring (preferable by an independent commissioning agent)
- Information and documentation relating to:
  - The design intent
  - As-installed details
  - Commissioning/tuning records
  - Training of building management staff
- Building tuning every 3 months to ensure efficient performance of the building in all seasons

3. Waste Minimisation

Construction waste minimisation strategies should be included as an integral part of the design process. The key principles are:

- Standardisation of building dimensions to standard material/module dimensions
- Maximisation of off-site pre-fabrication of building materials
- Accurate quantification of material requirements
- Specification of exact requirements to supplier
- Minimisation of packaging of materials delivered to site
- Adequate space allocation for waste segregation

Operational waste should be considered throughout the design process.

4. Material Selection

Where applicable environmentally responsible material selection should aim to maximise:

- Use materials with the least environmental impact
- Use products that originate and/or are made from with local materials and are manufactured locally
- Design and build for de-construction, re-use, adaptation, and recycling
- Minimise use of materials that off-gas chemicals during use and manufacture
- Selection of natural materials that use less synthetic chemicals, and can be returned to the natural environment without harm.
- Use structural steel with a high level of recycled content
- Use concrete with a high level of recycled flyash
- Use materials with low levels of volatile organic compound off-gassing.

The following is a list the types of environmentally friendly materials that should be considered for use for the Bank Street Development.

Asphaltic Concrete Flooring/Paving
Asphalt mix utilising crumbled rubber using scrap tyres, polymer modified and de-vulcanised rubber. Rubber is added from the vulcanisation process as liquid form to bitumen. The result is asphalt paving that lasts about twice as long as conventional asphalt due to its inherent resistance to wear.

Glassphalt
Hot mix where crushed glass is used to replace a portion of aggregate in asphalt concrete (Colour mix glass). The advantage of crushed glass is mainly in its processing cost, which includes reduced aggregate requirements, avoids landfill and reduces transportation costs.

Cement with Fly Ash content
By-product from burning coal, fly ash can be used as a sand replacement. Fly ash performs very well as part of cement, but requires the full 28 days curing time to gain its full strength.

Low-VOC Paints, sealers, stains
Water based acrylic paints that meet requirements for low VOC coatings and contain no formaldehyde, petroleum based solvents or other toxins.

Acoustic Ceiling Tiles
Perlite content ceiling tiles with no VOC emissions and contains no man made mineral fibres, naturally non flammable and anti-microbial. Post industrial recycled perlite content is also recyclable.

Carpet tiles
Post industrial recycled nylon content face fibre, reusable tiles.

Carpet base
Post industrial recycled rubber

Linoleum sheet flooring
Natural material components with minimal VOC's, natural anti microbial characteristics using post industrial recycled content, natural and renewable resource composition.

Ceramic tiles
Glass and clay content tiles, inherently inert, and no VOC emissions. Seventy percent of post industrial and post consumer recycled glass bottles are recyclable.

Cellulose insulation
Blow-in cellulose insulation manufactured without formaldehyde, newspapers with soy ink, non hazardous fire retardant and contains no man made mineral fibres. Post consumer newsprint fibre and recyclable.

Fibreboard
Medium density MDF manufactured without formaldehyde. Pre consumer recycled wood residual and recyclable.

Softwood Timbers
Readily available pine radiate preferred. Avoid using toxic wood finishes and detail sanding.

Gypsum wall board
Post industrial recycled gypsum content, 100% recycled content paper face fibre and recyclable.

Toilet partitions
Solid plastics manufactured without formaldehydes. Pre-consumer and post-consumer plastic bottles and recyclable plastics are preferred.

Masonry wall with render
Cement render colour impregnated using natural materials such as earth dye. Masonry block work cold process is not energy intensive and produces blockwork of ranging sizes and is fire resistant.

Steel Sheet roofing
Colour bond sheeting cold rolled to shape preferred over hot rolling process.

In general the materials proposed in this section are readily available from local manufacturers and should be considered in preference to selecting virgin materials.

5. Emissions

Minimising pollutants of any source from the precinct will play a major role in achieving high environmental credentials. Strategies which will be considered include:

- Use of ozone friendly refrigerants with low global warming potential.
- Minimisation of rainwater run-off into harbour.
- Minimisation of sewer inflow through the use of grey water systems or water minimisation strategies.
- Reduction of light pollution through appropriate lighting design.

6. Construction Phase ESD

Key environmental impacts associated with construction issues should include:

- **Acoustic Environmental / Noise Control**
  - Adequate acoustic conditions during construction activities will be required to minimise.
- **General Air Quality / Dust Control**
  - Minimising dust and pollutants from burning or vehicles, provision of dust control fences, revegetation of temporary stock piles.
- **Construction Indoor Air Quality Management Plan**
  - Develop management plan to monitor good IAQ throughout construction process.
- **Sediment and Water Control**
  - Control the quality of surface water leaving the site through provision of straw bales, silt stop fencing, sedimentation basis, stockpiling of top soil, appropriate location of vehicle refuelling depots.
- **Waste Management**
  - Prepare waste management plant to ensure waste minimisation through provision of waste separation facilities for recycling, minimising packaging, designated concrete wash down areas, avoiding burning.
- **Site Dirt / Mud on Roads**
  - Minimising pollution and land development impacts from the site through provision of wheel wash down facilities.
- **Site Transport Management**
  - Develop site transport management plan to control and minimise construction traffic access.
- **Hazardous Waste Management**
  - Prevent site contamination through providing designated chemical and fuel storage areas, reporting requirement of all spillages, preparation of site emergency response plant and site emergency plan, preventing bulk storage of fuel or hazardous chemicals on-site.

- **Protection of Site Biodiversity**

  - Minimise damage to the remaining biological diversity of the site through identifying species of conservation significance, placing protective fencing around significant trees, minimise loss of top soil and maintain a weed removal process.

- **Heritage Management**

  - Limit impact of construction site on heritage areas through identifying heritage sites and developing methodology to protect heritage aspects.

- **Materials Selection**

  - Minimise the use of construction materials that deplete natural resources through specifying the use of sustainable materials with recycle of component, setting minimum targets by weight of renewable materials, minimising the use of PVC and specifying the use of local vs overseas products.

7. Operational Phase ESD

Key environmental impacts associated with operational issues should include:

- **Waste Management Plan**
  - Providing verification of continual adherence to the intent of the design through water meter monitoring, benchmarking and investigating further water saving technologies.
- **Erosion and Sediment Control Plan**
  - Providing verification and continual adherence to the intent of the design through ongoing inspection of erosion and sediment measures as installed during construction phase to ensure regular maintenance.
- **Flora and Fauna**
  - Providing verification and continual adherence to the intent of the design to minimise the impact of the facility on the flora and fauna through implementing ongoing ecological monitoring to prevent damage, implement weed and pest control measures and conducting ecological surveys.
- **Indoor Air Quality (IAQ) Performance**
  - Providing verification and continued obligation to maintain high indoor air quality over time through regular calibration of air conditioning plant, auto-monitoring and replacement of filtration and calibration of CO_2 sensors.
- **Indoor and Chemical Pollutant Source Control**
  - Provide verification to design obligations in avoiding exposure of building occupants to hazardous materials through continuous inspection of storage areas and adhering to hazardous storage standard requirements.
- **Acoustic Environment / Noise Control**
  - Providing ongoing verification and assessment of building noise to verify system operation is in accordance with design specification through occasional monitoring.
- **Optimise Energy Performance**
  - Minimise ongoing energy consumption through providing ongoing energy monitoring and setting benchmarks and targets.